SEG-MJD 2016 Conference

Magmatic Evolution and Metallogeny of Turkey

İlkay Kuşcu*

Department of Geological Engineering, Mugla Sitki Kocman University, TR-48100 Mugla, Turkey

*E-mail, ikuscu@mu.edu.tr

Turkey, a collage of complex terranes in the Tethyan belt, has largely been shaped by interplay of several subduction and collision events related to the opening, final closure, and terminal suturing of the Tethys oceanic realms since the Permian. The mineral deposits in this collage resulted from subductional and postcollisional events due to closure of the NeoTethys ocean and collision between the Afro-Arabian passive margin and Eurasian active margin from the Late Cretaceous to Miocene. This collision resulted in (1) Pontide subduction due to closure of the northerly NeoTethys ocean, Izmir-Ankara Erzincan in the north between ca. 110 and 76 Ma, (2) Bitlis-Zagros subduction due to closure of the southerly NeoTethys ocean in the south between ca. 83 and 75 Ma, (3) exhumation of thickened crust after final suturing of Eurasian and Afro-Arabian plates between ca. 76 and 52 Ma, (4) postcollisional extension and collapse between ca. 52 and 40 Ma, and (5) Aegean-Helenic subduction due to closure of the Mediterranean Sea, the remaining NeoTethys ocean to the west, between 42 Ma and the present. These events generated voluminous calc-alkaline and alkaline magmatism, which reflects a transition from arc to postcollisional settings and the effects of collision and onset of crustal thickening and subsequent extension between ca. 110 and 9 Ma. Collectively, this led to a fertile metallogenic environment with abundant porphyry Cu, orthomagmatic, volcanogenic massive sulfide, skarn, epithermal, and iron oxide Cu-Au deposits, clustering in narrow arc segments, and post- to late-orogenic transtensional and transpressional settings.

The Early to Late Cretaceous-Paleocene tectonomagmatic evolution of Turkey is synchronous with the magmatic-hydrothermal systems, particularly for the Pontides and southeast Anatolia orogenic belt. However, this association is uncertain and open to debate for early-middle Eocene to Miocene systems in the Pontides and western Turkey. The available geochronological data clustering between ca. 83 and 70 Ma represent the final stages of Late Cretaceous magmatism.The early Paleocene and early Eocene magmatism is coeval with the exhumation of thickened crust and the onset of extension throughout the Pontides, Anatolides, and southeast Anatolia orogenic belt, and is also synchronous with the alkaline porphyry Cu-Mo, iron oxide Cu-Au (IOCG), and epithermal systems. The middle-late Eocene magmatism is commonly associated with continental to shallow-marine sedimentation within roughly E-W- to NNE- to NE-striking strike-slip to high-angle normal faults or Tertiary basins across Turkey. They are host to a variety of porphyry Cu, Cu-Mo, epithermal Au, Au-Ag, Pb-Au-Ag, and skarn Fe-Cu deposits in the Pontides, western Anatolia, central Anatolia, and southeast Anatolian orogenic belt. Oligocene to Miocene magmatism across Turkey fits well into extensive porphyry Cu, Cu-Mo, and Au systems, skarn Fe-Cu, Cu, IOCG systems, and epithermal Au-Ag, Pb-Au-Ag systems, particularly in western Anatolia, the central Anatolian volcanic province, and southeast Anatolian orogenic belt. The magmatic rocks hosting these systems are characterized by a gradual increase in La/Yb ratios, adakitic tendencies, and southward shifts of the magmatic locus with time, particularly in western Anatolia. This is accepted to be due to the effect of progressive crustal relaxation and extensional

and strike-slip deformation as the Aegean arc/Hellenic trench migrated and/or the subduction zone stepped southward.